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FINAL REPORT

Study of Excited State Energy Transfer Processes

Air Force Office of Scientific Research
Grant AFOSR 81-0067

covering the period

1 January 198# - 31 December 1982

Submitted by David E. Pritchard



11 May 1983

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Research Laboratory of Electronics
Cambridge, Massachusetts 02139

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AFOSR Final Technical Report 1982

We have completed and published a comprehensive review (1) of the theory and application of the several scaling and fitting laws for Rotationally Inelastic (RI) collisions which we developed under AFOSR support. The review will serve as a guide for allowing broader application of this approach by other members in the field.

We have shown (2) that a classical limit impulsive calculation can allow analytic evaluation of the RI basis rate constant k_{t+0} which predicts the power-law dependence $k_{t+0} = [t(t+1)]^{-\gamma}$. This provides simple theoretical support for this previously observed empirical observation which has been shown (1) to give good agreement with experimental and theoretical results in a large variety of RI collision systems.

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We have completed measurements and preliminary analysis $^{(3)}$ of the relative velocity dependence of RI cross-sections in $\text{Li}_2^*(A'\Sigma)$ -Xe. These cross-sections show an unusually strong dependence on velocity. Calculations using classical trajectory methods are presently underway to predict the experimental results, and thus gain information on the previously unknown Li_2^* -Xe interaction potential.

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